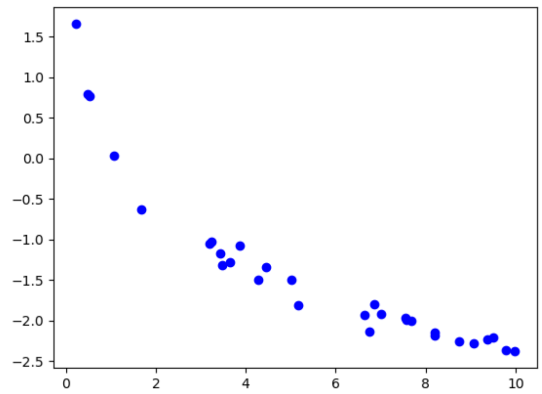
1. Determine the appropriate model for the graph of points below.



   A. Logarithmic model

   B. Non-linear Power model

   C. Linear model

   D. Exponential model

   E. None of the above

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2. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

   Uranium is taken out of the reactor with a temperature of 140° *C and is placed into a* 13° *C bath to cool. After 38 minutes, the uranium has cooled to* 75° *C.*

   A. $k = -0.02143$

   B. $k = -0.01858$

   C. $k = -0.01828$

   D. $k = -0.01887$

E. None of the above

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3. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 2 bacteria-α. After 1 hours, the petri dish has 18 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 254 minutes

B. About 42 minutes

C. About 221 minutes

D. About 36 minutes

E. None of the above

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4. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 800 grams of element X and after 4 years there is 160 grams remaining.

A. About 1 day

B. About 365 days

C. About 730 days

D. About 1460 days

E. None of the above

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5. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 2 hours, the petri dish has 243 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

   A. About 325 minutes

   B. About 192 minutes

   C. About 32 minutes

   D. About 54 minutes

   E. None of the above

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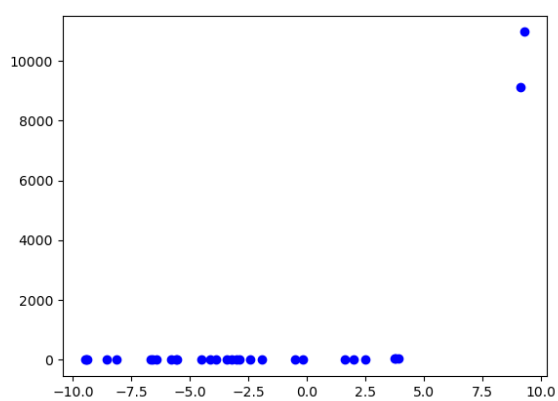
6. Determine the appropriate model for the graph of points below.



   A. Exponential model

   B. Non-linear Power model

   C. Logarithmic model

   D. Linear model

   E. None of the above

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7. A town has an initial population of 20000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	20120	20360	21080	23240	29720	49160	107480	282440	807320

A. Exponential

B. Logarithmic

C. Linear

D. Non-Linear Power

E. None of the above

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8. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $170°$ *C and is placed into a* $17°$ *C bath to cool. After 30 minutes, the uranium has cooled to* $118°$ *C.*

A. $k = -0.02507$

B. $k = -0.02551$

C. $k = -0.01736$

D. $k = -0.04013$

E. None of the above

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9. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 510 grams of element X and after 6 years there is 72 grams remaining.

A. About 1 day

B. About 1095 days

C. About 2555 days

D. About 730 days

E. None of the above

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10. A town has an initial population of 90000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	89840	89360	87440	79760	49040	0	0	0	0

A. Exponential

B. Logarithmic

C. Linear

D. Non-Linear Power

E. None of the above

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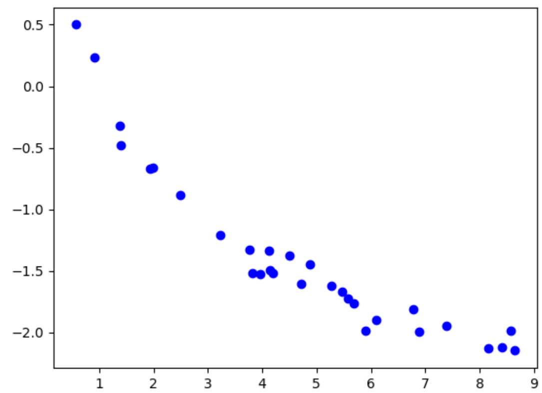
11. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Logarithmic model

C. Linear model

D. Exponential model

E. None of the above

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12. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 130° *C and is placed into a* 18° *C bath to cool. After 21 minutes, the uranium has cooled to* 83° *C.*

A. $k = -0.03388$

B. $k = -0.03301$

C. $k = -0.03476$

D. $k = -0.05110$

E. None of the above

13. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 1 hours, the petri dish has 29 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 221 minutes

B. About 36 minutes

C. About 125 minutes

D. About 20 minutes

E. None of the above

14. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 502 grams of element X and after 10 years there is 50 grams remaining.

A. About 1 day

B. About 5110 days

C. About 1460 days

D. About 1095 days

E. None of the above

15. Using the scenario below, model the population of bacteria α in terms

of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 3 hours, the petri dish has 11136 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 15 minutes

B. About 34 minutes

C. About 91 minutes

D. About 207 minutes

E. None of the above

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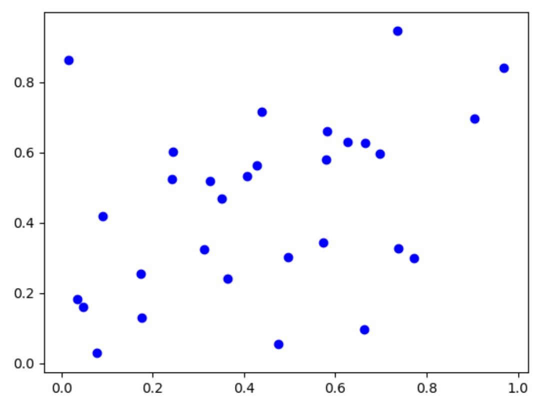
16. Determine the appropriate model for the graph of points below.



A. Linear model

B. Logarithmic model

C. Non-linear Power model

D. Exponential model

E. None of the above

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17. A town has an initial population of 40000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	40000	39986	39978	39972	39967	39964	39961	39958	39956

A. Logarithmic

B. Linear

C. Exponential

D. Non-Linear Power

E. None of the above

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18. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $150°$ *C and is placed into a* $12°$ *C bath to cool. After 22 minutes, the uranium has cooled to* $94°$ *C.*

A. $k = -0.03379$

B. $k = -0.05748$

C. $k = -0.03333$

D. $k = -0.02745$

E. None of the above

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19. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 994 grams of element X and after 6 years there is 110 grams remaining.

A. About 1 day

B. About 2555 days

C. About 730 days

D. About 365 days

E. None of the above

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20. A town has an initial population of 20000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	20000	20027	20043	20055	20064	20071	20077	20083	20087

A. Non-Linear Power

B. Exponential

C. Logarithmic

D. Linear

E. None of the above

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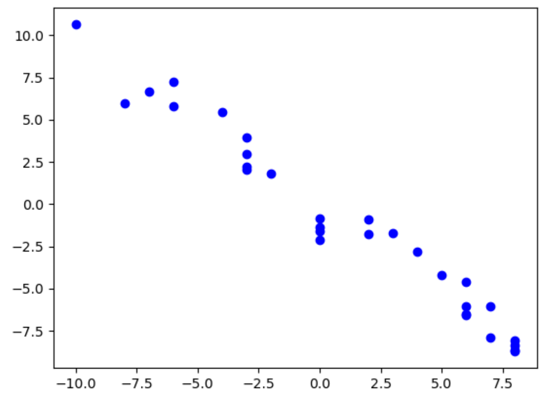
21. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Logarithmic model

C. Linear model

D. Exponential model

E. None of the above

---

22. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $100°$ *C and is placed into a* $13°$ *C bath to cool. After 36 minutes, the uranium has cooled to* $50°$ *C.*

A. $k = -0.02762$

B. $k = -0.01789$

C. $k = -0.01835$

D. $k = -0.02814$

E. None of the above

23. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 1 hours, the petri dish has 80 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 180 minutes

B. About 30 minutes

C. About 120 minutes

D. About 20 minutes

E. None of the above

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24. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 992 grams of element X and after 2 years there is 198 grams remaining.

A. About 0 days

B. About 365 days

C. About 1 day

D. About 730 days

E. None of the above

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25. Using the scenario below, model the population of bacteria α in terms

of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 1 hours, the petri dish has 79 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 13 minutes

B. About 83 minutes

C. About 170 minutes

D. About 28 minutes

E. None of the above

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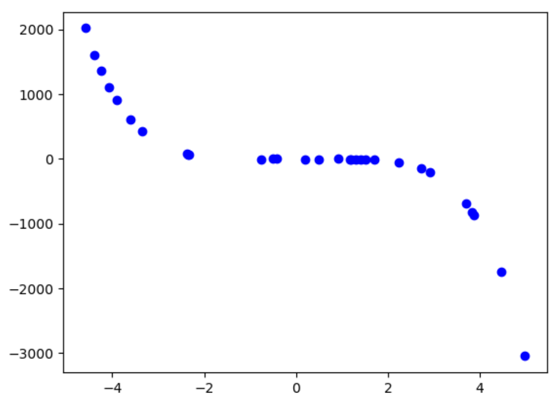
26. Determine the appropriate model for the graph of points below.



A. Linear model

B. Non-linear Power model

C. Logarithmic model

D. Exponential model

E. None of the above

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27. A town has an initial population of 80000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	80000	79972	79956	79944	79935	79928	79922	79916	79912

A. Linear

B. Logarithmic

C. Non-Linear Power

D. Exponential

E. None of the above

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28. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $180°$ *C and is placed into a* $19°$ *C bath to cool. After 38 minutes, the uranium has cooled to* $121°$ *C.*

A. $k = -0.01495$

B. $k = -0.01201$

C. $k = -0.01965$

D. $k = -0.02001$

E. None of the above

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29. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 876 grams of element X and after 4 years there is 125 grams remaining.

A. About 365 days

B. About 1825 days

C. About 1 day

D. About 730 days

E. None of the above

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30. A town has an initial population of 20000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	20000	20020	20032	20041	20048	20053	20058	20062	20065

A. Non-Linear Power

B. Linear

C. Logarithmic

D. Exponential

E. None of the above
